



## NOTE TO FILE

### *National Volatile Organic Compound Emission Standards for Aerosol Coatings*

#### Aerosol Coatings Industry Profile

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“National VOC Emission Standards for Aerosol Coatings”  
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# National Volatile Organic Compound Emission Standards for Aerosol Coatings

## Aerosol Coatings Industry Profile

Aerosol paints include all coatings that are specially formulated and packaged for use in pressurized cans. They are used by both professional and by do-it-yourself (DIY) consumers. The DIY segment accounts for approximately 80 percent of all sales. The remainder of aerosol coatings is sold for industrial maintenance and original equipment manufacturer use. Aerosol coatings are used for a number of applications including:

- Small domestic paint jobs
- Field and construction site marking
- Touch-up of marks and scratches in paintwork of automobiles, appliances and machinery.

The aerosol coatings industry includes the formulators and manufacturers of the concentrated product. These manufacturers may package the product or they may use toll fillers. These toll fillers work not only with the large manufacturers but for other paint manufacturers who do not have the specialized equipment to fill aerosols. The fillers may then supply the product to paint dealers, home supply stores, distributors, company-owned stores, and industrial customers. According to the National Paint and Coatings Association (NPCA), the trade association that represents approximately 95 percent of the manufacturers, the market is highly consolidated with three companies controlling over 85 percent of the U.S. market.<sup>1</sup>

This memorandum presents an overview of the aerosol spray paint industry, including an overview of aerosol formulations, pollutants, coating categories, and environmental regulations affecting the industry.

### **I. Aerosol Packaging and Formulation<sup>2,3</sup>**

An aerosol consists of a gas in which liquids or solid substances may be dispensed. In the aerosol package, a gas is put under pressure to liquefy the gas. When the package nozzle system is activated, the pressure is relieved and vaporization occurs. The can is kept closed by a stem gasket, which seals the opening under the nozzle button. The gasket is held in place by a spring inside a housing. When the nozzle button is pressed, it pushes the valve stem down against the spring, relieving the pressure and keeping the gasket sealed. When the seal opens, the higher pressure inside the can pushes the product through the dip tube and out of the valve. A controlled amount of propellant in the product vaporizes as it leaves the can, creating

the aerosol spray. The combination of product and propellant is finely tuned to produce the correct concentration and spray pattern for an effective product. The spray nozzle system is developed for each product.

Aerosol coatings are pressurized coatings containing pigments or resins that dispense the product ingredients by means of a propellant. They are packaged in disposable cans for hand-held application or for use in specialized equipment for use in ground traffic/marketing applications. Aerosol coatings are available in both solvent-based and water-based formulations.

Solvent –based aerosol coatings typically include the following:

- Gaseous Hydrocarbon Propellant
- Liquid Hydrocarbon Propellant
- Fast Evaporating Solvent
- Slower Evaporating Solvent
- Paint Solids

After the product is shaken to evenly distribute the coating solids, all of the ingredients except the gaseous hydrocarbon propellant are in a single homogeneous phase. The propellants in a solvent-based formulation are almost always hydrocarbon blends including propane, n-butane, or isobutane. The faster evaporating solvents used include acetone, methyl acetate, ethanol, and butanol with acetone being the primary fast evaporating solvent. Slower evaporating solvents used by the industry include xylene, toluene, butyl acetate, mineral spirits, and methyl ethyl ketone.

Water-based aerosol coatings are typically formulated as follows:

- Gaseous Dimethyl Ether Propellant
- Liquid Dimethyl Ether Propellant
- Fast Evaporating Solvent
- Water
- Slow Evaporating Solvent
- Paint Solids

Dimethyl ether is used in water-based coatings as the propellant because unlike the hydrocarbons used as propellants in solvent-based products it is water soluble. The faster evaporating solvents used in water-based coatings are typically alcohols such

as ethyl or propyl alcohol. The slower evaporating solvents are typically glycols or glycol ethers. In general, DME and water are present in equivalent amounts, about 35 percent by weight. The faster evaporating alcohols are approximately 5 percent by weight as are the slower evaporating glycol ethers. The remaining percentage is composed of solids.

## **II. Aerosol Coating Categories<sup>4,5</sup>**

In developing the national rule for aerosol coatings, EPA is using the same coating categories identified by the California Air Resources Board (CARB) in its regulation for aerosol coatings. EPA believes these categories adequately categorize the industry and using the same categories has the added benefit of providing product manufacturers with consistency between the state and national rule. The categories include six general categories and 29 specialty categories. Based on a survey of aerosol coating manufacturers conducted by CARB in 1997, the six general categories together with the specialty category Ground Traffic/Marking Coatings account for 85 percent of the ozone formed from aerosol coatings.

### **A. Clear Coatings**

Clear coatings are general use coatings that contain resins but no pigments or fillers so they are colorless. Flatting agents can be used to decrease the gloss of the coating, but they do not add color. Clear coatings may be formulated as solvent borne or waterborne coatings, although the majority of coatings are waterborne. Resins used in clear coatings include alkyds, polyurethanes, acrylic and nitrocellulose lacquers. Some specialty coating categories may also include clear coatings, but those clear coatings that perform specialized functions are not included in the general clear coating category.

Based on a 1997 survey of aerosol coating manufacturers conducted by CARB, clear coatings account for approximately 5 percent of the total ozone formed by the use of aerosol coatings.

### **B. Flat Coating Products**

Flat coating products are aerosol coatings with a low gloss level. To be considered a flat coating, a coating must register a specular gloss level that is less than or equal to 15 on an 85 degree meter, or less than or equal to 5 on a 60 degree meter. The gloss meter measures the amount of light reflected off the coating. Other products that are labeled as flat coatings are also included in this category even if they do not meet the criteria for a flat coating. Most of the products in this category are general use coatings but special-use flat paints would also be included in this category.

The formulation of a flat coating product varies with its intended use, cost, and color. Resins used in flat coatings include alkyds, acrylic and nitrocellulose lacquers, epoxies, and polyurethanes. Flat coatings are available in both solvent and water-based formulations.

Based on CARB's 1997 survey, flat coating products account for a little more than 8.5 percent of the total ozone formed by the use of aerosol coatings.

### **C. Fluorescent Coatings**

Fluorescent coatings are highly visible coatings due to the dyes that are used in the coatings. These dyes absorb light in the UV and visible regions and emit it in a narrow range of longer wavelengths in the visible region. This light gives articles their color and makes them appear to glow in the daylight. Fluorescent coatings are used for decorative purposes, as marking paints for construction and surveying, and for safety uses. They may also be used as "upside-down" ground marking or striping paints but when they are used for this purpose they are included in the ground traffic marking category and are subject to the limits for that category rather than the fluorescent coating category.

Fluorescent coatings use acrylic or alkyd resins. They are available in both solvent and water-based formulations. The pigments used in fluorescent coatings have poor durability and the color fades quickly so they are not used as protective coatings.

Based on CARB's 1997 survey, fluorescent coatings account for a little more than 1 percent of the total ozone formed by aerosol coatings.

### **D. Metallic Coatings**

Metallic coatings are topcoats that contain at least 0.5 percent elemental metallic pigment by weight and are labeled as "metallic," or with the name of a specific metallic finish such as bronze, gold or silver. Coatings may have a metallic pigment content less than 0.5 percent, but the appearance of these coatings is more like a nonflat coating and they are included in that category for the purposes of this regulation.

Metallic coatings may be "leafing" metallics or "nonleafing." In leafing metallic coatings, elemental metal is the only pigment in the coating. The metallic pigment is carried to the surface of the film during drying and the appearance is one of an almost continuous film of metal. In nonleafing metallic coatings, the pigment is distributed within the paint film and is used in conjunction with semi-transparent colored pigments. The metallic pigment contained within the semi-transparent color causes the coating to sparkle. Some nonleafing metallic coatings are formulated to match automobile finishes. Those coatings are included in the exact match category rather than the metallic coating category.

Metallic coatings are primarily solvent-based formulations. The use of the coating depends upon the type of pigment used. Coatings that use copper alloys as the pigment are not durable and are used primarily for indoor applications while coatings that use aluminum are more durable and can be used for exterior applications.

Metallic coatings are one of the largest contributors to ozone formation in the aerosol coatings category. The coatings account for approximately 9 percent of the total ozone formed by aerosol coatings.

#### **E. Non-Flat Paints**

Non-flat products are aerosol coatings with a specular gloss level greater than 15 on an 85 degree meter or greater than 5 on a 60 degree meter. Even if a product is labeled high-gloss it is not included in the non-flat category unless it meets this criterion. Non-flat products are typically general use products that do not fall under one of the other categories. However, special-use products can also fall under the non-flat category if they do not fall under one of the specialty coating categories.

Non-flat coatings are used for a variety of purposes including for rust protection, as touch-up finishes, and for coating small objects that would be difficult to cover with a brush. Both solvent and water-based formulations are available. Non-flat paints typically have higher concentrations of resin than flat paints because the resin provides the higher gloss.

Non-flat coatings are by far the largest contributor to the formation of ozone in the aerosol coatings category. Non-flat coatings account for approximately 46 percent of the ozone formed by aerosol coatings.

#### **F. Primers**

Primers are applied to a surface to provide a bond between the surface and subsequent coats. Primers provide this function by providing a rough, slightly porous surface which adheres to both surface and the topcoat. Any product labeled as a primer is included in this category with the exception of products labeled as auto body primers. General primers cannot be used with automotive topcoats because of the mix of solvents used in those products.

Primers are generally formulated with modified alkyd systems and typically have a higher solids content than the other coating categories. The higher solids content provides better hiding and build. Primers fill a variety of functions. Although the requirements for a primer vary depending upon the type of product being finished, in general they must protect against deterioration such as flaking, peeling, blistering and corrosion from chemicals and environmental conditions.

Primers account for approximately 9 percent of the total ozone formed from the use of aerosol coatings.

## G. Ground/Traffic Marking Coatings

Ground/traffic or marking coatings are used to apply striping or marking to outdoor surfaces such as streets, golf courses, parking lots, athletic fields, and construction sites. These coatings are often referred to as “upside-down” paints because they are applied in an inverted spray position. Unlike other spray paints, upside-down spray paints do not have a dip tube. These paints can be applied to a variety of surfaces including asphalt, concrete, steel, grass, soil and wood. Paints must be carefully selected for the type of application. Paints used for traffic striping on concrete or asphalt must withstand the wear from tires, rain, sun and other environmental factors for long periods of time. A product used on an athletic field, however, may only need to last a few months and should be formulated not to harm the grass.

Ground traffic or marking paints may be formulated as solvent or water-based formulations and may be fluorescent or non-fluorescent. They are typically high in solids. This category accounts for approximately 8 percent of the total ozone formed from the use of aerosol coatings.

## H. Specialty Coating Categories

The aerosol coatings category includes 28 specialty coating categories. These 28 categories account for approximately 14 percent of the ozone formed from the use of aerosol coatings. Therefore, the contribution of any particular category is relatively small. Of the 28 categories, exact match automotive finishes and high-temperature coatings account for the largest percent of ozone formation at 2 to 3 percent. Other categories contribute 1 percent or less to the total.

Following is a list of the 28 specialty coating categories, excluding ground traffic/marketing coatings, and the definition for each category that is included in CARB’s regulation for aerosol coating products.

***Art Fixative or Sealant*** means a clear coating, including art varnish, workable art fixative, and ceramic coating, which is designed and labeled exclusively for application to paintings, pencil, chalk, or pastel drawings, ceramic art pieces, or other closely related art uses, in order to provide a final protective coating or to fix preliminary stages of artwork while providing a workable surface for subsequent revisions.

- ***Auto Body Primer*** means an automotive primer or primer surfacer coating designed and labeled exclusively to be applied to a vehicle body substrate for the purposes of corrosion resistance and building a repair area to a condition in which, after drying, it can be sanded to a smooth surface.
- ***Automotive Bumper and Trim Product*** means a product, including adhesion promoters and chip sealants, designed and labeled exclusively to repair and refinish automotive bumpers and plastic trim parts.

- ***Aviation or Marine Primer*** means a coating designed and labeled exclusively to meet federal specification TT-P-1757.
- ***Aviation Propeller Coating*** means a coating designed and labeled exclusively to provide abrasion resistance and corrosion protection for aircraft propellers.
- ***Corrosion Resistant Brass, Bronze, or Copper Coating*** means a clear coating designed and labeled exclusively to prevent tarnish and corrosion of uncoated brass, bronze, or copper metal surfaces.
- ***Exact Match Finish, Engine Paint*** means a coating which meets all of the following criteria: (A) the product is designed and labeled exclusively to exactly match the color of an original, factory-applied paint; (B) the product is labeled with the manufacturer's name for which they were formulated; and (C) the product is labeled with one of the following: (1.) the original equipment manufacturer's (O.E.M.) color code number (2.) the color name; or (3.) other designation identifying the specific O.E.M. color to the purchaser.
- ***Exact Match Finish, Automotive*** means a topcoat which meets all of the following criteria: (A) the product is designed and labeled exclusively to exactly match the color of an original, factory-applied automotive coating during the touch-up of automobile finishes; (B) the product is labeled with the manufacturer's name for which they were formulated; and (C) the product is labeled with one of the following: (1.) the original equipment manufacturer's (O.E.M.) color code number; (2.) the color name; or (3.) other designation identifying the specific O.E.M. color to the purchaser. Notwithstanding the foregoing, automotive clear coatings are designed and labeled exclusively for use over automotive exact match finishes to replicate the original factory applied finish shall be considered to be automotive match finishes.
- ***Exact Match Finish, Industrial*** means a coating which meets all of the following criteria: (A) the product is designed and labeled exclusively to exactly match the color of an original, factory-applied industrial coating during the touch-up of manufactured products; (B) the product is labeled with the manufacturer's name for which they were formulated; and (C) the product is labeled with one of the following: (1.) the original equipment manufacturer's (O.E.M.) color code number; (2.) the color name; or (3.) other designation identifying the specific O.E.M. color to the purchaser.
- ***Floral Spray*** means a coating designed and labeled exclusively for use on fresh flowers, dried flowers, or other items in a floral arrangement for the purposes of coloring, preserving or protecting their appearance.
- ***Glass Coating*** means a coating designed and labeled exclusively for use on glass or other transparent material to create a soft, translucent light effect, or to create a tinted or darkened color while retaining transparency.

- **High Temperature Coating** means a coating, excluding engine paint, which is designed and labeled exclusively for use on substrates which will, in normal use, be subjected to temperatures in excess of 400 F.
- **Hobby/Model/Craft Coating** means a coating which is designed and labeled exclusively for hobby applications and is sold in aerosol containers of 6 ounces by weight or less.
- **Marine Spar Varnish** means a coating designed and labeled exclusively to provide a protective sealant for marine wood products.
- **Photograph Coating** means a coating designed and labeled exclusively to be applied to finished photographs to allow corrective retouching, protection of the image, changes in gloss level, or to cover fingerprints.
- **Pleasure Craft Finish Primer/Surfacer/Undercoater** means a coating designed and labeled exclusively to be applied prior to the application of a pleasure craft topcoat for the purpose of corrosion resistance and adhesion to the topcoat, and which promotes a uniform surface by filling in surface imperfections.
- **Pleasure Craft Topcoat** means a coating designed and labeled exclusively to be applied to a pleasure craft as a final coat above the waterline and below the waterline when stored out of water. This category does not include clear coatings.
- **Shellac Sealer** means a clear or pigmented coating formulated solely with the resinous secretion of the lac beetle (*Laccifer lacca*), thinned with alcohol, and formulated to dry by evaporation without a chemical reaction.
- **Slip-Resistant Coating** means a coating designed and labeled exclusively as such, which is formulated with synthetic grit and used as a safety coating.
- **Spatter/Multicolor Coating** means a coating labeled exclusively as such wherein spots, globules, or spatters of contrasting colors appear on or within the surface of a contrasting or similar background.
- **Vinyl/Fabric/Leather Polycarbonate Coating** means a coating designed and labeled exclusively to coat vinyl, fabric, leather, or polycarbonate substrates.
- **Webbing/Veiling Coating** means a coating designed and labeled exclusively to provide a stranded to spider webbed appearance when applied.
- **Weld-Through Primer** means a coating designed and labeled exclusively to provide a bridging or conducting effect for corrosion protection following welding.

- **Wood Stain** means a coating which is formulated to change the color of a wood surface but not conceal the surface.
- **Wood Touch-up/Repair/Restoration Coating** means a coating designed and labeled exclusively to provide an exact color or sheen match on finished wood products.

### III. Emissions<sup>6</sup>

In 1993, the U.S. Environmental Protection Agency (EPA) conducted a census survey of consumer and commercial product manufacturers. The data from the survey were used in evaluating and ranking consumer and commercial products for regulation under Section 183(e). The survey requested information on product sales, total VOC content of coatings, and VOC speciation data. In addition, manufacturers were asked to provide data on methylene chloride and 1,1,1-trichloroethane usage. Among those included in the survey were manufacturers of aerosol coatings.

The survey results for the aerosol coatings category were based on data from 1,164 products. Total VOC content reported for the category was 88,344 tons from sales of 131,341 tons of product. The estimated market coverage for the category was 100 percent.

The survey also requested VOC speciation data. The primary VOC's emitted by aerosol coatings at the time of the survey were acetone and a mixture of propane, butane, and isobutene. Acetone was the primary solvent used by the category while propane, butane, and isobutane were the primary propellants used by the industry. Acetone accounted for more than 25 percent of the total VOC emissions and the propellants propane, butane and isobutane accounted for more than 30 percent. Other pollutants emitted by aerosol coatings include toluene, xylene, methyl ethyl ketone, dimethyl ether, and methylene chloride.

The survey results are intended to provide a baseline for evaluating the impact of future regulations on emissions. Since the survey was conducted, EPA has determined that acetone is a negligibly reactive compound and has exempted the compound from the definition of VOC in recent regulations. Therefore, if acetone is subtracted from the total VOC emissions reported in the survey, total VOC emissions at this time are significantly reduced from the 1990 baseline.

### IV. Existing Regulations for Aerosol Coatings<sup>7,8</sup>

There are currently no national regulations limiting the ozone formation potential from aerosol coatings. California is the only state that regulates aerosol coating products. Unlike other California regulations for consumer and commercial products

that regulate the VOC content of those coatings, the California regulation for aerosol coatings directly limits the ozone formation potential of aerosol coatings by establishing limits on the reactivity of aerosol coating products. A more thorough discussion of the reactivity approach and the reactivity limits are presented in {ref to BAC memo}.

Although California is the only state currently regulating aerosol coating products, both New Jersey and Texas are considering adopting regulations for these products. A New Jersey workgroup consisting of industry and state environmental representatives released a document entitled “Volatile Organic Compounds from Processes and Consumer Products – Recommendations for Further Consideration.” The workgroup recommended that the New Jersey Department of Environmental Protection consider adoption of a rule similar to California’s regulation for aerosol coatings unless the EPA proceeds with its own regulation on a schedule that allows New Jersey to receive credit in its State Implementation Plan (SIP) by 2009.

The Texas Commission on Environmental Quality (TCEQ) recently commissioned a study to evaluate the potential impact of regulating aerosol coating products. One of the conclusions of the study was that Texas should consider adopting a rule similar to California’s rule for aerosol coating products.

## **V. References**

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